PATENT SPECIFICATION

423,464

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March 28, 1933:

Corresponding Applications in United Kingdom

No. 75/34 } Dated Jan. 1, 1934.
No. 76/34 }

(One Complete Specification Left under Section 91 (2) of the Patents and Designs Acts, 1907 to 1932.)

Specification Accepted: Feb. 1, 1935.

COMPLETE SPECIFICATION

Improvements in Light Reflectors

I, GUSTAVE LERAY, a French Citizen, of 2bis, Rue du Capitaine Ferber, Paris, (Seine), France, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to light reflecting elements which are capable of being assembled so as to form a reflector, the reflecting surface of which is not discontinuous. The outline of such a reflector may be of any desired shape and may be limited by curves so as to form letters, signals and so on.

It is well known that three reflecting mirrors disposed in the form of a tri-rectangular trihedron, that is to say, with their planes mutually at right angles to each other, provide a reflector capable of returning any luminous ray which falls on this system parallel to the incident direction.

It is also known and has been described in various optical works that the three reflecting mirrors may be constituted by ordinary reflecting faces (in the case of separate mirrors, a hollow trihedron) or by total reflection faces (in the case of a block of glass).

In one of its forms, the reflecting element in accordance with the invention has a plane base, a surface opposite to the said base made up of three planes intersecting each other at right angles and having an apex disposed perpendicularly above the centre of symmetry of the base and four lateral faces between the base and the surface opposite to it which are plane and are disposed at right angles to the said base and each at right angles to the two adjacent planes. Such an element has a plane rectangular base, but in another form in accordance with the invention, two of the said four planes are replaced by portions of coaxial cylinders and the other two are inclined to each other so as to intersect in a line coinciding with the axis of the cylinders so that the base then has the shape of a sector of an annulus. In another modified form, one of the planes of which the surface opposite to the base is made up may be replaced by a convex surface, for example a portion of the surface of a cone.

In all cases, the elementary solid in accordance with the invention constitutes an irregular polyhedron having eight real or effective faces, that is to say, not counting as faces the truncation of certain apices or edges which may be effected.

In order that the invention may be well understood and may be easily carried into practice, some examples embodying it will be described in more detail with reference to the accompanying drawings, in which:—

Figures 1, 2 and 3 relate to a form of construction in which the projection of the reflecting surface on to the base plane is circular or annular.

Figure 1 is a plan view of a reflecting element, a number of which can be assembled to form an annular reflector.

Figure 2 is an elevation of the element shown in Figure 1.

Figure 3 is a plan of a reflector made up of reflecting elements such as are shown in Figures 1 and 2.

Figures 4 to 7 relate to two other forms of construction in which the reflecting surface is limited by straight lines. The tri-rectangular trihedra formed by the three elements of surface constituting the surface opposite to the base are then limited by four planes forming a prism with a rectangular or square base.

Figures 4 and 5 are respectively an elevation and a plan of an assembly of rectangular elements where the projection of the apex is at the centre of the rectangular base and where one edge of the trihedron constituting the surface opposite to the base is parallel to a side of the rectangle.

Figures 6 and 7 are respectively an elevation and a plan of an assembly of elements where the projection of the apex is at the centre of the square and where one

edge of the trihedron passes through one of the corners of the square.

If the construction shown in Figures 1 to 3 is first of all examined, it is seen that the reflecting element is constituted essentially by a tri-rectangular trihedron having an apex S and edges A, B and C. The axis about which the various elements are disposed is represented at Z.

The edge A passes through the axis Z through which also pass the planes P and Q which limit the faces AC and AB. The limiting faces D and F of the reflector are portions of cylinders of revolution having Z as their axis.

The face BC of the trihedron may be plane or it might be a portion of the surface of a cone of revolution having Z as its axis and to which the plane of the face BC shown in the drawing would be a tangent.

One of the results of making one of the three faces of each tri-rectangular trihedron as an element of a cone, is to give the reflector a slight divergence, that is to say, a parallel incident beam is returned after reflection as a divergent beam. The field of visibility of the reflector is thus increased.

The part of the reflector which receives the incident light is made as a plane element perpendicular to the axis Z.

It will be seen from the above description that the projection of the element on to a plane perpendicular to the axis Z is a sector of an annulus limited by the traces of the planes P and Q and the traces of the cylinders D and F.

This allows the elements to be assembled in the form of a ring without leaving any spaces between them so that a reflecting surface without discontinuity is obtained as shown in Figure 3.

The device which has just been described can be mounted and arranged for use in numerous ways; for example, a lens having concentric flutes, ribs or corrugations might be placed at the centre of an annular reflector. Its applications are also numerous; the device is particularly suitable for use as a rear reflector for motor vehicles because, while it is a very good reflector for a source of light situated at infinity in front of it, it is also to some extent transparent to light emitted by a source situated at a short distance behind it so that if a lamp is fitted behind it, it becomes visible without having to be illuminated from any other source.

In the case where the reflecting surface is to be of a shape other than annular one, the portions D and F will no longer be elements of cylinders having a circular base but will be elements of cylinders the generators of which will be substantially parallel to the axis of the trihedron, and a section through which will have the shape of the element of curve limiting the reflecting surface.

The planes P and Q will then be perpendicular to this curve element.

In the construction shown in Figures 4—7, the axis Z is at infinity and therefore, each reflecting element consists of a tri-rectangular trihedron having an apex S and edges A, B, C, and the faces of which are limited by four planes forming a prism with a rectangular or square base.

These four planes may or may not be perpendicular to the front face V of the plate which carries the reflecting elements, but the limiting planes of all the trihedra consist of pairs of parallel planes.

By juxtaposition of the elements, properties identical with those of a single tri-rectangular trihedron having the same area as that of the plate are obtained.

The projection of the assembled trihedra on to the plane V which limits the said trihedra at the front is thus a network having identical rectangular or square elements.

The projection of the apex S of each tri-rectangular trihedron lies within the rectangle or the square either at the centre of this figure or at some other point.

The axis of each tri-rectangular trihedron (intersection of the bisecting planes of the dihedra of the trihedron) may be perpendicular to the front plane V, or slightly inclined to this perpendicular.

It is quite evident that the reflecting elements can also, as shown in Figures 3, 5 and 7 form a unitary structure either with or without their supporting member.

The whole assembly can be obtained in one piece by moulding from a transparent material which may or may not be coloured. In this case, the conical portions of successive elements join up without discontinuity so as to form an element of the surface of a circular cone, and the divergence will be proportional to the curvature of the said conical surface.

If desired, the faces of the trihedra may also be silvered, which considerably increases the field of visibility of the reflector.

The device in accordance with the invention may also have a metallic reflecting surface silvered, chromium plated or treated in any other equivalent manner and having internal surfaces corresponding to the external surfaces of the de-

vices already described.

Certain slight modifications of detail may be made; for example, some deformation of certain plane faces can be allowed, and the edges or apices may be truncated.

The device in accordance with the invention may be used for night signalling and will appear luminous to a distant observer situated substantially opposite the device and near the luminous source, for example, to a motorist whose car has its head lamps lit.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A light reflecting element, the base of which is plane, the surface of which opposite to the base is made up of three planes intersecting each other at right angles and having an apex disposed perpendicularly above the centre of symmetry of the base, and the remaining faces of which consist of four planes disposed at right angles to the said base and each at right angles to the two adjacent planes.

2. A modification of the element according to Claim 1, in which two of the said four planes are replaced by portions of co-axial cylinders, and the other two planes are inclined to each other so as to intersect in a line coinciding with the axis of the cylinders.

3. A modification of the element according to Claim 1 or Claim 2, in which one of the planes of which the surface opposite to the base is made up is replaced by a convex surface.

4. A light reflecting element having internal surfaces corresponding to all the faces of a solid having the shape of those claimed in any preceding Claim except that face which receives the incident light and in which the reflecting surfaces consist of mirrors.

5. A light reflector made up of reflecting elements according to any preceding Claim, assembled so that there is no discontinuity in the reflecting surface and which is bounded by plane or continuously curved surfaces.

6. A light reflector according to Claim 5, in which the elements and their support are moulded in one piece from a transparent material.

7. A light reflecting element substantially as described with reference to the accompanying drawings.

8. A light reflector made up of elements according to Claim 7, substantially as described with reference to the accompanying drawings.

Dated this 1st day of January, 1934.

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FIG. 1

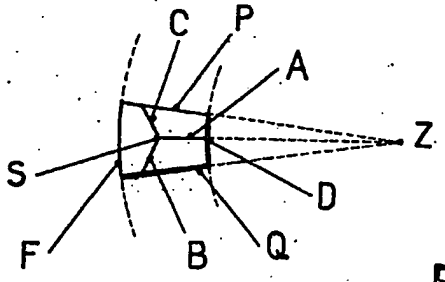

FIG. 2

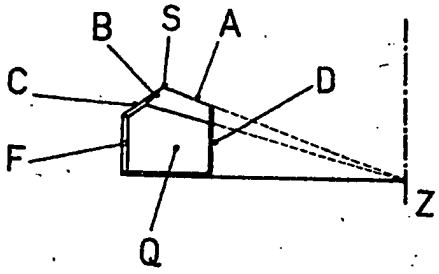

FIG. 3

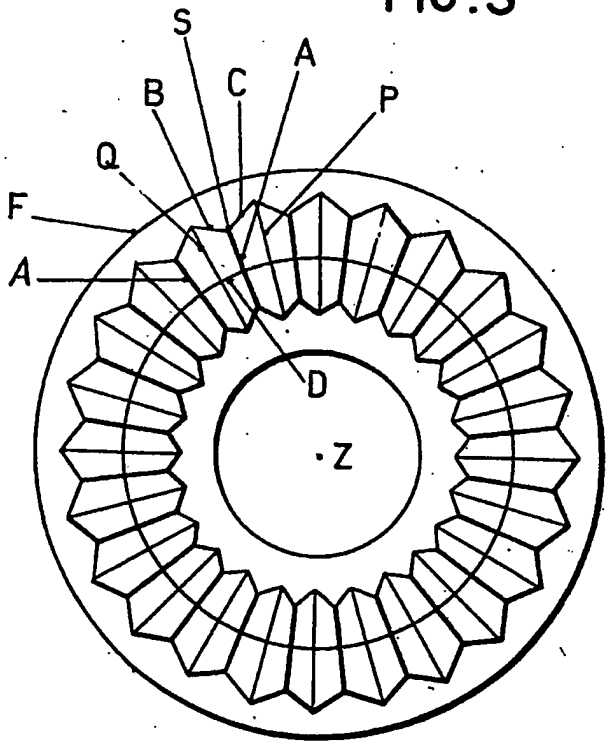

FIG. 4

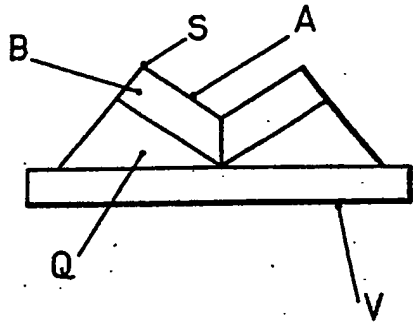

FIG. 6

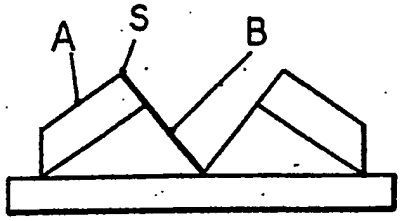

FIG. 5

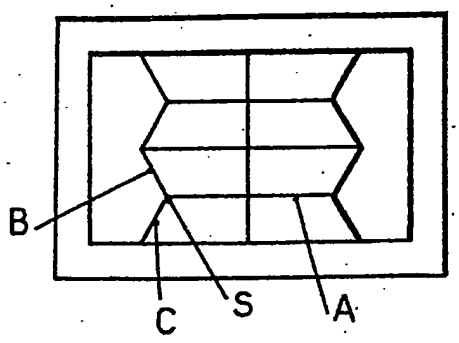

FIG. 7

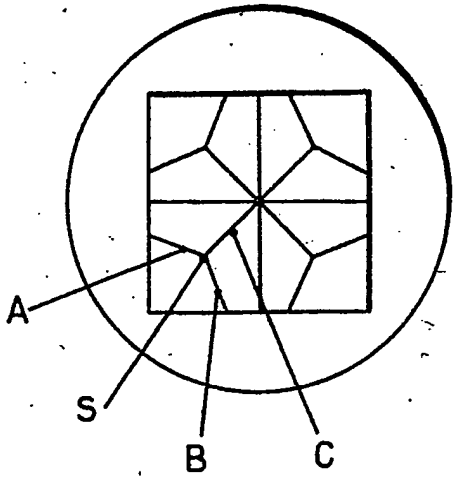

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FIG. 1

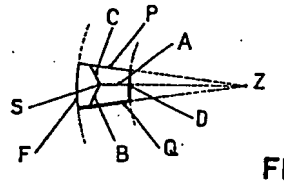


FIG. 2

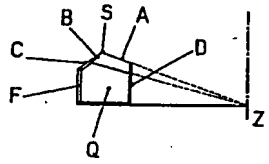


FIG. 3

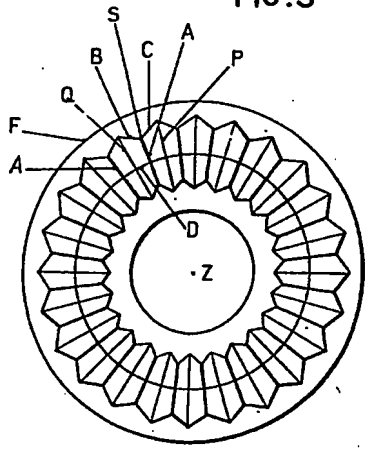


FIG. 4

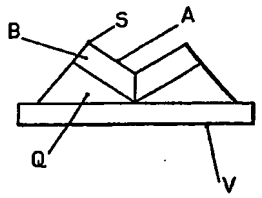


FIG. 6

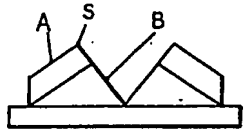


FIG. 5

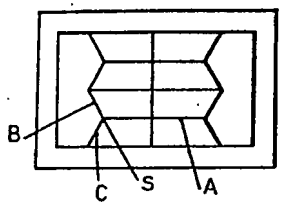
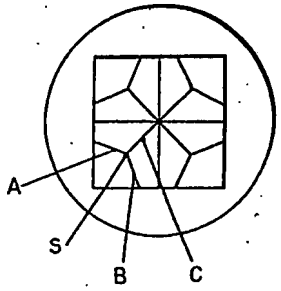


FIG. 7



[This Drawing is a reproduction of the Original on a reduced scale.]

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